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OF BOSTON.

(Class of 1851).

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A TREATISE

ON THE

CAMP AND MARCH.

WITH WHICH IS CONNECTED

THE CONSTRUCTION OF FIELD WORKS AND MILITARY BRIDGES.

WITH AN

APPENDIX OF ARTILLERY RANGES, &c.

FOR USE OF

VOLUNTEERS AND MILITIA IN THE UNITED STATES.

Dearborn

BY HENRY D. GRAFTON,

CAPTAIN FIRST REGIMENT U. S. ARTILLERY.

BOSTON:
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STEREOTYPED AT THE
BOSTON STEREOTYPE FOUNDRY.

PREFACE.

IN our country, where no standing armies are maintained and the people must form the army in times of danger, any information, however slight, respecting military affairs, it is trusted by the writer may be regarded as useful. No claim is laid to originality, the regulations of our small army and the best works having been used.

This treatise must only be regarded as rudimentary; as the subject matter, if thoroughly treated, should consist of many volumes. Those who have seen large bodies of volunteers suddenly brought together must be aware of the necessity of even a slight knowledge of the duties of the camp and the conduct of a march being generally diffused through the mass. Our uniformed militia are generally acquainted with much contained in this treatise; but if any information should be obtained by them, or a desire imparted for further research, something at least will be gained.

Only such reference is made to movements of "several columns" as at least should be known by every subaltern; and as, in times of threatened attack, our militia would necessarily have to occupy our seaboard defences, it was thought advisable to attach, in an appendix, a table of ranges of artillery, with the elevations for distance, &c., taken from the United States Ordnance Manual. As at this time Europe, and nearly all Asia, are in arms, and we cannot tell how soon in the course of events we may be called upon to protect our own liberties, it is hoped, in presenting this small work, it may be received with indulgence.

H. D. GRAFTON.

LONG ISLAND, August, 1854.

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brush, &c., to make small huts, or a blanket on one or two stakes as a covering; but the order of encampment is still preserved.

Troops are always encamped in the order of battle. The front of the camp occupies the same extent of ground as the troops when drawn up in line according to their established formation. The intervals between the battalions of infantry are forty-four feet. The companies encamp in streets perpendicular to the line; one half of the tents on each side of the streets, facing inwards. The width of the streets will depend on the strength of the companies. The distance between each tent is two feet; the distance between the tents of one company and those of another four feet. A regiment of infantry, six hundred strong, will occupy a front of six hundred feet, allowing two feet for each file. The front is divided as follows: First, deduct forty feet for the width of the main street, passing through the centre of the camp to the colonel or commanding officer's marquee, and the remaining five hundred and sixty feet are divided among the companies.

The dimensions of a camp for a regiment of six hundred men are, —

Front, ... 600 feet.
Depth, ... 810 feet.

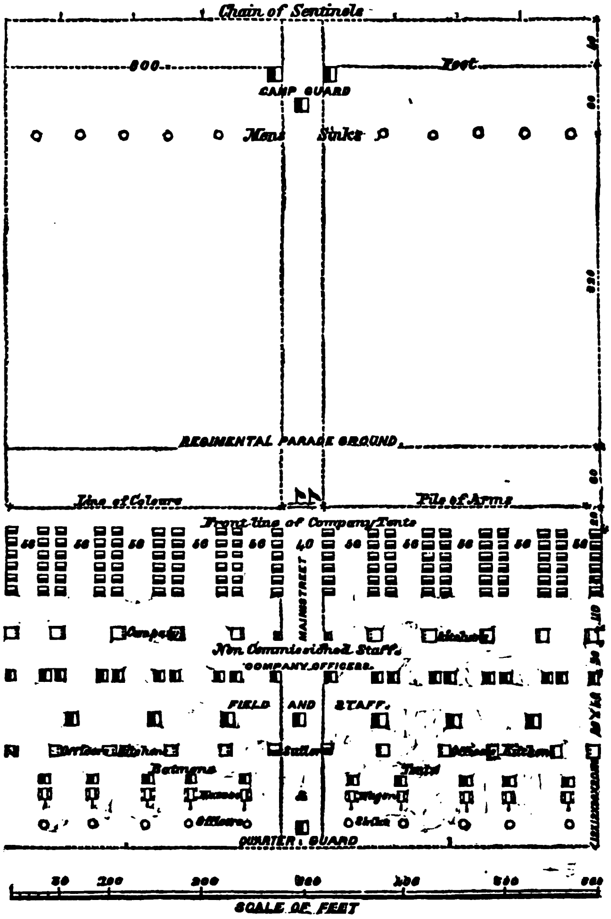
(See Plate I.) The different distances are laid off in feet; as, for example, from the front line of company tents to the stack of arms and colors is twenty feet; from the colors to the regimental parade is sixty feet, &c., as marked on the plate.

The tents of all the officers face towards the front; those of the captains are placed in a prolongation of the line of the right flanks of the companies; and those of the subalterns on a prolongation of the line of the left flanks; the colonel or commanding officer's marquee in the centre of the main street; the lieutenant colonel's opposite the centre of the right wing; the major's opposite the centre of the left

ORDER OF ENCAMPMENT

FOR A

Regiment of Infantry.



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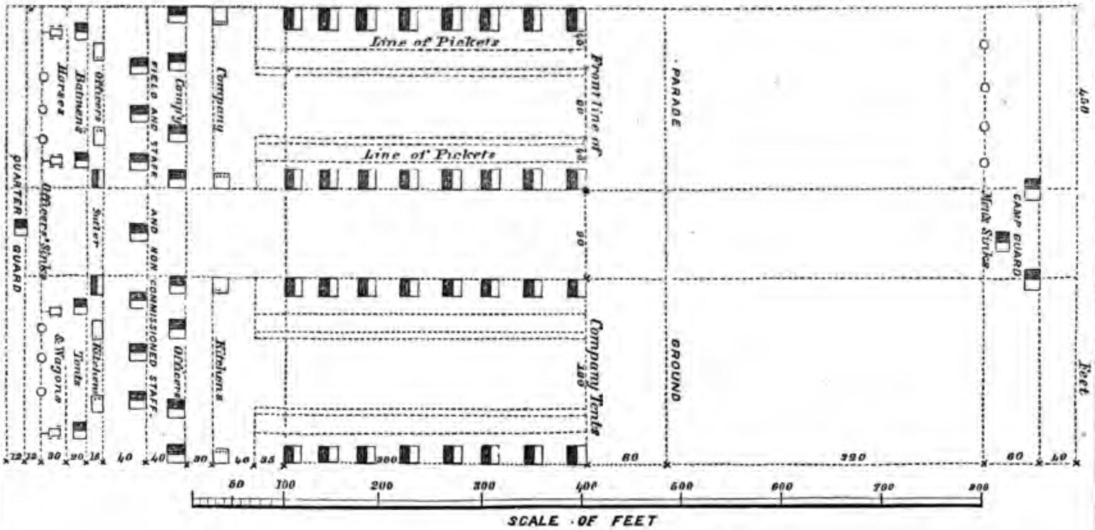

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Only such reference is made to movements of "several columns" as at least should be known by every subaltern; and as, in times of threatened attack, our militia would necessarily have to occupy our seaboard defences, it was thought advisable to attach, in an appendix, Their duty is to hold the enemy in check in case of an attack; hence it is important that the positions occupied by them should be capable of a good defence; villages, defiles, &c., are good positions. When these cannot be had, temporary obstacles can be used, such as a breastwork of fallen trees, bags of earth, or sand, &c.

The line of pickets should be about half way between the main body and the exterior line; and patrols should be sent out frequently, especially when near the enemy, from this line. In an attack, the grand guard does not retire until it has received all its outposts, and not then unless attacked by a superior force; when falling back, it must take advantage of every cover offered by the ground, and, feeling the enemy, must retire in such a manner as to fall on the flank of the picket; by doing so, the grand guard in its retreat does not mask the enemy. The picket must not fall back until it has received the whole of its grand guards and outposts, and not then if the point is an important one and can be held against the attacking force. If it is thought the attack is a prelude to a general engagement, the general commanding must determine whether to reënforce a particular picket or to direct its retreat; generally it is better that the picket should fall back than that reënforcements should be drawn from the main body. The sentinels in advance of the exterior line should be posted where they can obtain a good view and at the same time not be exposed to the enemy; at night, the sentinels should be posted nearer to the outposts than in the daytime; no singing, smoking, or any noise should be allowed, and the men should be ready for an attack at all times. The officer in command of an outpost should examine the ground upon which he is placed, and be constantly vigilant; and he should send a written report to the officer in command in the rear of any extraordinary movement he may be able to ascertain or see in the enemy's camp. If not very near the enemy, a patrol might be sent forward cautiously to reconnoitre. No communication should be allowed with the enemy, and no flag be permitted to pass the line without orders from the rear. As about daybreak is the usual time selected by an enemy for an attack, the sentinels should be cautioned not to relax in vigilance at that time; the outposts are usually relieved at this time, and the old guard does not retire until a patrol sent out returns and reports all quiet. The distance of the first, or exterior line, from the main body must vary with the nature of the country, position of the enemy, &c.; the mean distance can be stated as two miles; the line occupied should take in all approaches to the front and flanks of the position. Each picket throws out several grand guards, and each grand guard several outposts, from which the sentinels are taken to be posted; but no more than one half of the strength of each picket should be employed as grand guards and outposts. In cantonments, or when a camp is to be occupied for some time, advanced posts, and thrown farther forward, and favorable to a strong resistance, are more necessary than under ordinary circumstances; they must be able to resist and check the enemy, so as to allow time for the different corps to concentrate. Patrols should also be kept up between the different posts, and also move on the flanks, and penetrate to the rear of the enemy to obtain what information they can respecting him.

Camp and quarter guards are for the security of the camp and for preserving good order and discipline; every regiment furnishes these guards. The camp guard of a regiment consists of one lieutenant, a sergeant, a corporal, one drummer, and twenty-seven privates; the quarter guard of one corporal and nine privates. The camp guard of the front line is posted four hundred and twelve feet in front of it; if the army encamps in two lines, the camp guard of the second line will be the same distance in rear that they are in front in the first line, (412 feet,) each opposite the centre of the regiment. Each camp guard posts nine sentinels, two before the guard, two on the right, and two on the left; these six sentinels with those from the other regiments form a chain around the camp. Two sentinels are placed before the colors and arms, and one before the marquee of the commanding officer of the regiment. To complete the chain of sentinels around the entire camp, two flank guards are detailed from the line by orders from head quarters, and consist of as many officers and men as may be deemed necessary for the purpose. The object of the camp guard being to form a chain of sentinels around the camp, the commanding officers of divisions or brigade can increase or diminish the number of sentinels so as to answer the purpose. The quarter guard is posted twelve feet in rear of the line of wagons, and furnishes three sentinels, one at the guard, and one opposite the centre of each wing of the regiments. *General officers' guards* are furnished by their respective commands; for the general-in-chief, the guard is furnished by the line and from each brigade in turn; the number and description of troops is determined at the head quarters. The guard of a major general is one subaltern, one sergeant, one corporal, and twenty privates, and is furnished by his own division, each brigade furnishing it by turn. The guard of a brigadier general is one sergeant, one corporal, and twelve privates, from his own brigade. Besides these guards, there are others, if necessary, for the protection of supplies. There is in each camp, when deemed necessary by the general-in-chief, a force called the *inlying picket;* this picket consists of one or more companies of each regiment, according to the strength the general may deem necessary for it. This picket is formed about retreat beating, and remains on duty until the same time the next day, when a fresh picket takes its place. After the picket has been formed and examined by its officers the men are dismissed, but are required to keep on their clothes and accoutrements and hold themselves ready to turn out at a moment's notice. Whenever a detachment is taken from an inlying picket, it must be supplied immediately. Officers on the inlying picket are considered as liable to be relieved and employed upon other duty.

All guards mount at the same hour, which is appointed by the commanding officer. The camp and quarter guards parade before the centre of the regiment. The guards of a major and brigadier general are formed by a staff officer attached to one of the brigades of the division and sent from the brigade parade. The other guards, including that of the general-in-chief, being composed of detachments from the line by brigades, each detachment is formed on the brigade parade, and sent with an adjutant or other commissioned officer to the grand parade. All guards, except those which are honorary, are divided into three reliefs for each post. Patrols should be sent out from the camp guard during the day and night as often as deemed necessary, to make observations and to commit to the guard all men found out after tattoo not on duty.

The countersign or watchword is given to such persons as are entitled to pass and repass during the night, and to the officers, non-commissioned officers, and sentinels of the guard. The parole is imparted to only such officers as have a right to visit guards and make the grand rounds and to officers commanding guards. (All general officers, as well as the officer of the day, can go the grand rounds.) It is the duty of the officer of the day to furnish the officer of the guard with parole and countersign before retreat, and to visit the guard during the day, and also to make his rounds at night when he visits the guard, which must be after twelve o'clock. Camp guards are relieved every twenty-four hours, and the guards at outposts are ordinarily relieved in the same manner; but circumstances may require their remaining on duty several days, or even weeks, in cantonments. They should then be notified beforehand, to prepare themselves accordingly.

It is the duty of officers in all guards to inspect all reliefs of sentinels, both when they go and when they come off their posts, and to use every means in their power to keep the men under their command in the most perfect state of vigilance and preparation: they must ascertain that the non-commissioned officers are correct in the performance of their duties, and frequently visit the sentinels, to be assured that they know their duties and have received proper instructions. The officer of the guard must have the countersign delivered to the sentinels on post about twilight. In case one of the guard deserts, the countersign is changed by the officer of the guard, and he immediately notifies the officer of the day, who communicates the same to the other guards and to head quarters.

Duties of Sentinels. — Sentinels will not allow themselves to be relieved except by an officer or non-commissioned officer of the guard or party; nor will they receive any orders from any other than the above-named persons except the commanding officer and the officer of the day, who will immediately notify the officer of the guard of the orders given. Sentinels must take the greatest care not to be surprised, and must keep themselves on the alert, observing every thing that takes place within sight and hearing; they carry their arms at a support or on either shoulder, but never quit them; in wet weather, if there is no sentry box, they must "*secure arms.*" It is a most serious military offence for a sentinel to quit his post without leave; and sentinels should not hold conversation with any person when not necessary for the proper discharge of their duties. During the day the sentinels at the outposts must stop every party of men, whether armed or not, until they have been examined by an officer

A sentinel placed over the colors and arms must permit no person to touch them except by order of some officer or a non-commissioned officer of the guard. If placed over a magazine or supplies of any kind, he must call for the "corporal of the guard" if any person under the rank of officer wishes to touch them. Placed over prisoners, he must suffer no person except an officer or a non-commissioned officer of his guard to converse with them. In case of disorder a sentinel must call out "the guard;" and, if a fire takes place, he must cry, "Fire!" adding the number of his post; if in either case the danger be great, he must discharge his musket before calling out.

It is the duty of sentinels to repeat all calls made from posts more distant from the main body of the guard than their own; and no sentinel should be posted so distant as not to be heard by the guard, either directly or through other sentinels. Sentinels at the outposts communicate with their party by preconcerted signals, as whistling once or twice, &c. Sentinels at the outposts pay no compliments, as stated before. Other sentinels present arms to general and field officers, and to the officer of the day, and to the commanding officer, (even if he is below the rank of major;) to all other officers they carry arms. When a sentinel in his sentry box sees an officer approach, he must stand at attention; and, as the officer passes, he salutes him by bringing the left hand to the musket as high as the right shoulder. The sentinel at the guard tent, when he sees any body of troops or an officer entitled to the compliment approach, he must call, "Turn out the guard!" After sunset, the regulations dispense with guards turning out as a matter of compliment; yet sentinels should, when officers approach their post, pay them proper attention by facing outwards and standing steady at shouldered arms; this is observed until the evening is so far advanced that the sentinels commence challenging. Immediately after receiving the countersign and until reveille, sentinels must challenge all who approach them; they must not suffer any person to advance nearer than the point of the bayonet, until they have received the countersign, placing themselves in the position of *arms port* for that purpose. A sentinel, in challenging, will call out, "Who comes there?" If answered, "*Friend, with the countersign,*" and he be instructed to pass persons with the countersign, he will reply, "*Advance, friend, with the countersign!*" If answered, "Friends!" he will reply, "Halt, friends! Advance *one* with the countersign!" If answered, "Relief," "Patrol," or "Grand rounds," he will reply, "Halt! Advance, sergeant, (or corporal,) with the countersign!" and satisfy himself that the party is what it represents itself to be. If he have no authority to pass persons with the countersign, if the wrong countersign be given, or if the persons have not the countersign, he will cause them to stand, and call, "*Corporal of the guard!*

CHAPTER II.

FIELD FORTIFICATION.

SECTION I.—*Description and Construction of Field Works.*

CAMPS are sometimes strengthened by the throwing up of field works, and then they are called intrenched camps. When a position is taken up by a general, more or less field works are constructed on the flanks, and also frequently along the front; hence some knowledge respecting them, the different kinds and manner of throwing them up, is important to every officer. A treatise of this description will only allow them to be referred to generally, and the most important details only mentioned.

Field fortification is the art of constructing all kinds of temporary works on the field. In throwing up works in the field, various kinds are made use of, viz., the straight line, the indented line, or, as it is sometimes called, the *crémaillère* line, the lunette, priest cap, redan, redoubt, star forts, and the bastioned fort. The lunette consists of two faces and two flanks, and is open in the rear, (the entrance to a work in the rear is called its gorge;) this work is used to cover a point, as a bridge, ford, &c. The priest cap is used in connection with the right or indented line, so as to have a flank and cross fire in front of them. The redan is the same as the lunette, but has no flanks. The indented line is often used instead of the straight line to obtain a cross fire. A polygonal form, without reëntering angles, is called a redoubt.

This work is not open at its rear, and is intended to resist an attack on all sides; the redoubt called the square redoubt is the most common form. It is not necessary, however, to make the redoubt exactly square, for it is the ground upon which this work is to be situated that must determine the shape: if the redoubt is to be constructed on a height, the line must be traced in such a manner that even to the foot of the declivity must be exposed to the fire of the musketry of those in the work; and they should at least discover every thing within five hundred paces of the redoubt. The star forts take their name from their figure: they are seldom used, as they occupy the same space as the redoubt: their interior capacity is smaller, and they require more men to defend them. The strongest field work is the bastioned fort: all the principles of defence are more fully satisfied by it, but more time and labor are required in its construction; this work, therefore, should only be used in positions of importance and when time permits. A bastioned fort may have any number of sides; but the square or pentagon is generally used. To plan a bastioned fort, the square or pentagon is laid out and the sides bisected by perpendiculars: one eighth of the side is laid off in perpendicular for a square and one seventh for the pentagon. (See Fig. 3, Plate III.) From the angles of the polygon, lines are drawn through the points thus set off; these are called the lines of defence. Set off on these lines a distance equal to two sevenths of the side of the polygon, these are the faces; from the extremities of the faces draw two lines perpendicular to the lines of defence, these are the flanks; through the points where these last meet the lines of defence draw a straight line, which is the curtain of the work. All these works mentioned are surrounded by a ditch and other obstacles, to which more reference will be made hereafter.

The component parts of all works or intrenchments are, the parapet, which is the mass of earth thrown up to cover the troops; and the ditch, from which the earth is taken to form the parapet. The mode of constructing or throwing up these works is similar. The profile, (see Fig. 1, Plate III.,) which is made by a vertical plane perpendicular to the direction of the parapet, shows the form of the parapet and the ditch. The exterior slope is that part of the parapet towards the enemy; it receives generally the same slope that the earth takes itself when thrown up. The top of the parapet is called the superior slope. The interior slope is the part against which the men lean in firing. The banquette is the part on which the men stand to fire over the parapet; the top of the banquette is called the *tread*, and the inclined plane the *slope* of the banquette. The *crest* is a term applied to those points of profile where a salient angle is formed; and the *foot* is a term applied to a point where a reëntering angle is formed by two lines, taken in connection with a superior line; as, foot of the exterior slope. The *berm* is a space between the parapet and the ditch to prevent the earth from giving way. The scarp is the slope of the ditch next the parapet; the opposite side is called the counterscarp. The glacis is a small mound in front of the ditch; it is hardly ever used in field works. A profile of a work shows only the elevation; the plan exhibits the different directions of the lines of the parapet and the form of the work. In most intrenchments or field works, such a disposition is made of the parts of the work as to obtain what is called a flanked arrangement; to make this disposition, certain parts are thrown forward, which are called advanced parts, or faces, and receive the attack; the other parts are named the retired parts, and consist of the flanks and the curtain. The angular parts towards the enemy are called salients; and those towards the occupants of the work, the reënterings. By this flanked arrangement the enemy's flank is reached by the fire of the retired parts when he is advancing on the salient. The line of defence is the distance from the salient point to the opposite flank; and the angle of defence is the angle formed by a face and the opposite flank. A line bisecting a salient angle is called the capital. The ground upon which a work is constructed is called the plane of site. The height of the interior crest above the site is called the command; and the *relief* is the height of the interior crest above the bottom of the ditch. In planning a work, the interior crest is the directing line in regulating the dimensions of the faces, flanks, &c., because this line shows the column of fire for defence of the work. There exists a necessary relation between the plan, command, and relief of the works, which prevents the dimensions of one being regulated independent of the others: thirty and eighty yards are the two limits for the faces; twenty and forty yards for the flanks; and the curtain should not be less than twelve times the relief. These dimensions, stated generally, show the proportion of one part to the other. The position having been selected for throwing up an intrenchment, if the ground is level the work receives a uniform relief; but when it is broken or irregular the relief varies: if there are commanding eminences within one thousand yards that can be occupied by the enemy, the relief must vary so as to intercept the enemy's fire: when the work is so arranged, it is said to be defiled. However, defilement is not necessary to make a good defence, and often it is not practicable.

The operation for direct and reverse defilement of an intrenchment is laid down in most works on fortification. (Professor Mahan, in his Field Fortification, describes it.) In this treatise it will be sufficient to state that in the defilement of a work the interior crest is in an ideal plane, which passes at least eight feet above every point of the parade, and at least five feet above every point that can be occupied by the enemy's artillery in the vicinity. If a height cannot be held by our own troops, and unless it is absolutely necessary that the work should be placed near it, it is much better that the intrenchment should be thrown up beyond the cannon range of the height. Traverses are used in works to prevent the enemy from enfilading or firing along a face or any line of the work; they are mounds of earth, thrown up and finished on top like a roof, with a slight pitch, and are placed perpendicular to the face to be covered; they should be thick enough to be cannon-proof. Traverses are also constructed sometimes to serve as magazines, storehouses, &c. When powder magazines are made in traverses, every precaution should be used to prevent the powder from becoming damp; and the mouth of the magazine must be covered by what is called a splinter-proof shelter; this is formed by placing scantling side by side at an angle of forty-five degrees, and covering the same with two feet of earth, and, lastly, throwing over this hides or a tarpauling. The artillery in a work is usually placed in the salients; the light pieces are in the salients, and are in what is called "barbette;" that is, they are placed upon a mound of earth thrown up for the purpose, so that they can fire over the top of the parapet: the upper surface of this mound should be level, and two feet nine inches below the interior crest for guns of small calibre; if heavy guns are in barbette, this surface should be four feet below the interior crest. This mound is thrown up against the interior slope, and has a depth of twenty-four feet and a width of from sixteen to seventeen feet for each gun: to ascend this mound, an inclined plane of earth, termed a ramp, is used: the sides of the ramp should receive the natural slope, and it be placed at some convenient point. A gun is said to be "in embrasure" when it fires through an opening cut through the parapet called an embrasure; embrasures are generally cut on the flanks, and are for heavy guns. A work with artillery must not have a weak profile, as it can be too easily carried before the artillery can have its full effect. For works open in the rear, a stockade made of trunks of trees, sunk in the ground side by side, can be used as an enclosure: the trunks should be from nine to twelve inches in diameter, and twelve feet long; the tops should be eight feet above the ground. A banquette is thrown up in the interior, and loopholes cut four feet three inches above it: these loopholes should be eight inches wide in the interior, and from two to three inches on the exterior, and about ten inches long. A small ditch, three feet deep, dug on the outside, and the earth thrown up against the stockade, will strengthen the work. In our country, where wood is in abundance, stockades can be frequently used for purposes of defence with great advantage, especially where artillery cannot be brought to bear against them; and blockhouses, constructed of logs, timbers, &c., are capable of obstinate resistance. Secondary obstacles are often made to impede the progress of the enemy. These artificial constructions should be placed within short musket range; those generally made use of are pits, abatis, palisades, chevaux-de-frise, small pickets, and inundations. The pits are dug six feet deep, with a diameter at top of six feet, and at the bottom of one foot: a sharpened stake is planted firmly in them, the point six inches below the tops. The pits are in three rows, near the ditch, the middle row being between the intervals of the other two; these pits are sometimes covered with light brush, and the earth spread over them, or else the earth dug from them is arranged in small hillocks between them. An abatis is formed by taking the limbs of trees, cutting off the smaller branches, and pointing the others; these are laid in a row: the larger end is partly secured in the ground by picketing, and the ends of the different limbs interlaced with care, and presented towards the enemy. Abatis are placed in front of the ditch, and covered by a small glacis from the enemy's artillery. Abatis can often be used in a wooded country, with advantage, in defending the skirts of a wood the light troops, by felling trees so that their branches will interlace, and by cutting the trunks about four feet above the ground, and leaving the trees to hang by the stump, will be able to form a strong obstacle to the enemy. A chevaux-de-frise is made by taking a square piece of six-inch scantling, about twelve feet long, and perforating the same with holes two inches in diameter, five inches apart; round poles, ten feet long and shod with iron points, are passed through these holes: several of these, united together by hooks and chains attached to their ends, form a chevaux-de-frise; they answer against cavalry, and on rocky ground to form an obstacle; but abatis and palisades are more generally used. Palisades are constructed by splitting the straight trunks of trees, which are about twenty inches in diameter and eleven feet long, into rails: each trunk should furnish seven rails; each rail, or palisade, is pointed at top; a row of these is firmly set in the ground, three feet deep, vertical, or slightly inclined outwards, and about three inches apart: they are connected together by two strips of plank called ribbons nailed across them, one strip about one foot below the ground, and the other one foot from the top; a palisading is generally placed in the ditch at foot of the counterscarp, the points about fourteen inches below its crest. *Small pickets* made of tough wood, about two feet long, and driven into the ground in what is called the quincunx order, about one foot apart, and interlaced with cords, or vines, form an *entanglement*. An obstacle is formed sometimes by damming back a shallow watercourse so as to make it overflow the valley: to be of use, it should be four feet deep; and, unless five feet deep, ditches and pits should be dug beforehand. If the dam is exposed to the fire of artillery, it should be regulated, as regards thickness, the same as a parapet; sluices should be made to regulate the level of the water in the pool above in case of heavy rains. Artificial inundations should not, however, be much relied upon; but when they can be constructed without much difficulty they should not be neglected, as they cause delay and apprehension to the foe.

To throw up a work, a line is first traced on the ground with a pick, showing the direction of the interior crest: poles having been planted at the angles of the work, with the height of the interior crest marked on them, cords are then stretched at distances of about thirty yards apart, horizontally between two pickets, perpendicular to the line marked with the pick; a square picket is driven into the ground where the cord crosses the line marked by the pick, and a piece of pine is nailed upright to this picket; the top of this piece of pine is as high as the interior crest. (Fig. 2, Plate III.) Measure on the cord the thickness of the parapet, and drive another picket at that point, and nail another upright as before to the picket, and mark on it, or make it as high as the exterior crest. The base of the interior slope and tread of the banquette are laid off in the same manner, and, except at the foot of the banquette and at the foot of the exterior slope, pieces of pine are nailed, as before, to the pickets; these uprights are now connected together by nailing other slips of pine to them, giving them the necessary slopes, as from interior crest to exterior crest, and from interior crest to tread of banquette; the profile of the parapet is thus formed. The foot of the exterior slope and foot of the banquette having been marked out with a pick, and the crests of the scarp and counterscarp of the ditch also marked out in the same manner, all the arrangements preparatory to excavation are complete. The workmen are now distributed to commence; the counterscarp crest is divided off into lengths of twelve feet for the different working parties; a pick and two shovels are placed near the counterscarp, two shovels near the scarp, and one man to ram and one to spread for two working parties. The pick commences inside of the counterscarp crest so far, that by digging vertically three feet he will arrive at the slope of the counterscarp; the excavation is carried on in this manner again to the depth of three feet, advancing towards the scarp, where the excavation is carried on by the same method; steps or offsets are thus made in the ditch, which facilitates the workmen: these are cut away last. The earth is thrown forward, spread and rammed in layers of about twelve inches from banquette slope to exterior slope. In making the parapet, a drain should be formed at some suitable point to carry the water from the interior to the ditch, and a gutter of boards should be laid against the scarp. The exterior slope is given the natural slope the earth takes; the interior slope and the scarp sometimes receive a revetement, either of sods, hurdles, planks, fascines, &c., for the scarp timber is employed. (A revetement is a facing of the above, or other material, to sustain an embankment steeper than the natural slope.) For a sod revetement, the sods are cut with short, thick grass upon them; they should be four and one half inches thick, and of two sizes, the first twelve inches square, and the other eighteen inches by twelve; they are put on in two layers, the first layer with the grass downwards and pinned to the soil with short pickets; these sods are arranged so as to break joints. A hurdle revetement is made of poles about one half an inch in diameter; they are driven into the banquette in the same direction as the interior slope, about nine inches apart, and interlaced with twigs. A pisa revetement is made of earth and clay mixed with a little water; sometimes chopped straw is mixed up with the mass: the pisa is laid in layers twelve inches thick and two feet broad, and well packed. In making a fascine revetement two sizes of fascines are used; the larger size is twelve inches in diameter and twenty feet long, and is called a soucisson; these fascines are used for revetements of batteries;

the smaller size is nine inches in diameter and ten feet long. To make a fascine, straight twigs are selected, about the thickness of the little finger; the smaller twigs are stripped off. A fascine horse is constructed: this machine is made by driving two stout poles into the ground about two feet, so as to cross each other obliquely about two feet above the ground, where they are tied together; as many of these supports as may be required are put in a straight line, about eighteen inches apart, and on these the twigs are laid to be bound. An implement called a fascine choker, which is made by taking two stout levers, about five feet long, and connecting them near their extremities by a chain or strong cord, which should be long enough to go once around the fascine, and is drawn tight by the levers, is used. The twigs are laid on the horse with their large and small ends alternating, the choker brings them together, and they are bound by withs, or gads made of twigs, or else stout ropeyarn is used; the gads are placed about one foot apart, and every fourth one should have an end three or four feet long, with a loop to receive a picket through it; this picket is called an *anchoring* picket. To form the revetement, the first row of fascines is embedded about half its thickness below the tread of the banquette, and is secured by means of the anchoring pickets, and also by other pickets driven through the fascines; the knots of the withs are laid inside, and the earth of the parapet is well packed behind the fascine; a second row is laid on the first, so as to give the necessary interior slope; this row should break joints with the first row; they are also connected by pickets driven through them both. The other rows are laid in the same manner, and the top of the parapet is finished off with a course of sods. Planks are sometimes used for revetement, and also sand bags; but these bags are only used when other materials cannot be procured. Sand bags are principally used to form a speedy cover; they are made of coarse canvas, and are two feet eight inches long, and one foot two inches wide; they are three fourths filled with earth, and tied loose when about to be used.

SECTION II. — *Lines, Bridges, Heads, &c.*

When extended positions are covered by intrenchments, with a front in one direction, these intrenchments are called lines. Lines are either continued or with intervals. The same principles apply to the construction of lines as to those before mentioned; but, from their great extent, they usually receive but a slight relief, and the simplest angular figures are adopted. In laying them out, all natural obstacles should be taken advantage of, to diminish the labor and strengthen the position. Continued lines can be arranged with a series of redans, connected together by straight curtains; the faces of the redans are sixty yards in length, their salient angles sixty degrees; and the distance between their capitals is one hundred and eighty yards; this is termed the redan line. In this line the ditches are not well flanked and the salients not well protected; to overcome this defect, the tenaille line has been constructed, which is formed by breaking the curtain so as to form two faces perpendicular to each redan; this line is, therefore, a series of large and small redans: the salients are better protected by this arrangement and the ditches better flanked: the small redans, which are the retired parts, are good positions for the artillery. The faces of the large redan should not exceed one hundred and sixty yards; the salient angle not less than sixty degrees; the faces of the smaller redans should not be greater than forty yards, and perpendicular to those of the large redans. This system is defective as respects the long faces it exposes to enfilade fire and the depth of ground it occupies, so that in many localities it cannot be used. The indented or *crémaillère* line is used oftener than any other, and is generally preferred for a continued line; it requires little depth of ground, and is more easily adapted to its variations: when an indented line is constructed across a valley, the line should conform to the slopes of the ground, and the long branches should be thrown back, so that their prolongation will fall within the salients of the advanced works on the heights; this prevents them from being enfiladed. In forming an indented line, the long branches alternate from the middle point, where there is either a salient or a reëntering angle; the latter is generally considered the best. Continued lines are useful where irregular and raw troops are brought into action; they give confidence, and are a guard against being surprised; but they do not admit of an active defence. The enemy can retire, if repulsed, in good order, and renew the attack at a more favorable time. Lines with intervals are better adapted to disciplined troops: the works used for these lines consist either of lunettes or square redoubts: the salients are two hundred and fifty yards apart, and the salient angles are ninety degrees; the faces and flanks are so arranged as to sweep the ground in front of the salients of the collateral works. In rear of the first line, and opposite the intervals, redans are placed to flank the faces of the first line. The works in the first line should be large enough to contain three hundred men and a field battery in each; if lunettes are used in the first line, the gorges should be closed by a palisade and also abatis. The system of lines, with intervals, proposed by the French general Rogniat, consists of lunettes, the salient points two hundred and fifty yards apart; their faces and flanks are placed in defensive relations. Between these lunettes is a redan: the redan flanks the faces, without interfering with the fire of the flanks: a straight curtain is carried from the redan, on both sides, and leaves a space of ten yards, between it and the ends of the flanks of the lunette, for sorties. (See Plate III.) The lunettes receive the minimum profile for a parapet; that is, it is six and one half feet high; the ditch is six feet deep; the redans are simple epaulements, to cover cannon fired in barbette, the parapet being two feet six inches in height; the curtain consists of a trench, the earth thrown up in front to form the parapet, and which is so arranged that the infantry can march from the trench over it in order of battle. Works of this kind can be thrown up easily in one night. The lunettes contain infantry only, and the artillery is in the redans; the curtains are defended by infantry, from which point they can make a sally, and, aided by light artillery and cavalry, attack the enemy in flank.

If no natural obstacles protect the flanks of this line, General Rogniat proposes a strong, square redoubt on each flank, and a heavy battery in the interval between the redoubt and the adjacent lunette. In lines with intervals, the main body of the army is drawn up in rear of the works, and, as soon as the enemy is repulsed in his attack on the lines, assumes the offensive and charges the enemy, and, if obliged to retreat, falls back, covered by the works. In all arrangements of lines, the flanks are the weak points; they should rest, if possible, on some inaccessible point, as a river, or else strong works must be thrown up for their protection. All intrenchments should be defended to the last extremity; and the assailed should mount the parapet, and rely chiefly on the bayonet to repel the assault, when the enemy commences to get upon the berm. Every intrenchment should contain a reserve in proportion to the number of troops engaged in its defence; this reserve should be used only in critical moments, and cover the retreat of the assailed if driven from the parapet. Bridge heads (*tête de ponts*) are intrenchments thrown up on the banks of a river to cover a communication and to secure the manœuvres of a corps that is to force the passage of a river or pass it in retreat. Bridge heads are made of different forms: if to cover a bridge of communication, and there is not much to apprehend from the enemy, a simple redan or lunette is sufficient; these might also be combined with the straight or indented line. The flanks of the works should rest upon the banks, to prevent being turned. When a very important point is to be guarded, such as to protect an army in retreat or secure its safety in advance, much stronger works should be constructed than these mentioned; the simple or complex crown is then used. The simple crown is a central bastion and two half bastions, near the banks; the flanks of the half bastions, which protect the central bastion, should be longer than the other two. Batteries should be established on the opposite shore, to sweep the ground in front of the faces and cross their fire in front of the salient. The complex crown consists of a polygon of three or more sides, on each of which a bastion front is constructed: heavy batteries should be established on the opposite shore; and, if there are any islands in the river near the works, they should be fortified to flank them. Intervals of from ten to twenty yards should be left between the shore and the works for the troops to defile through; this interval is covered by a traverse in the rear. In bridge heads covering important points, a stockade or other work should be established near the entrance way to each bridge; this work should command the other intrenchments around it. This work, or works in case there is more than one bridge, must be occupied until the last in a retreat, to protect the workmen in swinging round or breaking up the bridge: rafts or boats should be supplied for this guard to retreat by: the rafts should have sacks of cotton or wool on the side towards the enemy; and they are propelled to the opposite shore either by ropes or oars. The best points at which to erect bridge heads are the bends and elbows of the river, the reënterings being towards the assailed; by this means the bridge head can be protected by a flank and cross fire from the opposite shore.

To fortify a village, the environs of the same should be thoroughly examined and every advantage taken of natural obstacles. In throwing up intrenchments, these intrenchments should be sufficiently far from the houses, so that in case they are set on fire the troops will not be incommoded by the flames and smoke or be injured by the splinters occasioned by the enemy's artillery. Walls and hedges that are suitable should be used in defence as parapets, and those that would shelter the enemy must be destroyed; the roads leading to the village should be broken up, and the artillery so placed as to command the entrances and accessible points. The streets should be barricaded, and the houses in the vicinity of the barricades should be arranged for defence: stockade works, or wagons, carts, &c., sunk in the ground up to their axles and filled with earth, form a good barricade; also bales of cotton or wool, and casks placed side by side and filled with earth, answer against a sudden attack. In arranging a house for defence, every thing that is in it that can be used to strengthen the defences should be employed for that purpose: bricks taken from the chimneys can be used to barricade the lower windows: flooring boards, pillows, blankets can be used for the same purpose: joists of floors may be used as buttresses: balconies, if any to the upper windows, can easily be placed in a defensive state, with thick boards and holes cut through the flooring, which assist in defending the lower story. If there are no balconies, temporary ones can be constructed with stout scantling, confined on the inside to the floor by means of ropes, with which they are fastened to the joists. The roof, if not fireproof, should be torn down, and the floor of the upper story covered with earth or wet manure to the depth of two feet. The garrison of the village should be made acquainted with the communications to be followed from all the exterior defences to the rallying points in the village, short cuts being made for these communications. Every precaution should be taken to prevent confusion, especially in case of retreat.

CHAPTER III.

MARCHES.

SECTION I.—*March of a single Column, or Detachment, and Passage of Rivers.*

THE march of a detachment, when made beyond the reach of the enemy, should be conducted so as to fatigue the troops as little as possible; and, for the conduct of the body, experience and knowledge are required, especially if the detachment is large. The length of a day's march must vary according to climate, nature of the country, roads, and the circumstances under which it is undertaken. In time of peace, troops moving for drill and discipline should not march more than fifteen miles per day, even when the climate is mild and the roads fair: under orders not pressing, eighteen miles per day may be considered a fair average. The manner of executing a march beyond the reach of the enemy should be similar to its execution within reach, the same rules being applicable in the one situation as the other, except in the case where the detachment, being removed from the enemy, is said to march "en poste;" that is, when transportation, such as wagons, steamboats, &c., are made use of to hasten its arrival at its destination.

The following description suggests the manner in which the march of a single column, or detachment, should be conducted. The details for the advanced and rearguards having been made, the strength of each of which must be governed by the nature of the march, whether near the enemy, advancing or retreating, &c., the advance takes the road generally as soon as it is light. The leading company having formed immediately after the departure of the advanced guard, the other companies take full or half distance, as ordered; if the detachment consists of more than one regiment, full distances are preserved between the regiments, and also between the brigades. (If the column should, however, consist of more than one division, the different regiments or battalions, and also squadrons of cavalry, march, well closed, full distance being preserved between the divisions.) The march is commenced with perfect regularity, and is continued in order for ten or twelve minutes, when the officer commanding gives the command, "Route step!" This command is executed by each company in succession, commencing with the leading company. The rear rank falls back one pace, and the guides preserve the distance required between the different companies, or platoons; the men carry their arms as they please, and conversation and smoking are allowed to the command. On an advance, the baggage wagons follow in the rear, either double or single, as the road permits, and a rearguard follows lastly. On a retreat, the wagons are sent in advance under a strong escort, and, if practicable, on a road parallel and near the one to be followed by the column. In this case the rearguard occupies an important position, and should be constituted, both as regards its numbers and kind of troops, as circumstances require. The troops, having marched about one hour and a half, are halted by command and rested about seven minutes, so that the time lost at the halt shall not exceed ten minutes before they are again "en route." The points for halting should be selected, if possible, near water. In re-forming, guides take proper distance; men fall into their places, (which the captains should not permit them to separate themselves from any great distance during the rest.) At ordered arms, each captain gives the command, "Shoulder arms!" when the second company before him moves; and also "March!" in time to preserve the proper interval. The march is thus resumed in strict order for a few minutes, when the route step is again taken by order of the commanding officer. A halt thus takes place about every four miles until the day's march is finished. When more troops than a regiment are marching together, they should not be allowed to break or pick their way around any obstacle, as mud or water in the road. An obstacle of more moment — as a ford — should be passed by breaking into sections or half sections; and, after the leading company has passed and advanced a sufficient space to be occupied by the rest of the command, a short halt is ordered. In passing a defile, the leading company moves either by platoon, section, or file, according to its width, and halts on the other side until the rear of the company comes up, and then moves forward quickly to a distance equal to the depth of the column, when it is halted. The second company follows the first, and halts at the outlet for its rear to come up, and then moves forward and takes its distance from first company; so with the next; and the march is resumed when the command has passed through.

When there is danger of an attack, the defile must be passed with caution. The advance enters with an advance from its body, thrown forward as skirmishers: there is also a reserve that follows the main body of the advanced guard, equal in strength to about one eighth of the advance. Flankers will also be sent out, and will occupy commanding crests, and, if possible, also proceed along the heights. The strength of the flanking party will depend upon varying circumstances; as, if both or only one of the sides have to be occupied, the nature of the defile, the proximity of the enemy, if known, &c.

On a march, the commanding officer of a detachment that is near the enemy must so regulate the movement as not to be attacked without due warning and being prepared to receive it. In passing through a wooded country, the flankers of the advance should examine the ground thoroughly and cautiously, so as not to allow it to fall into any ambuscade. Patrols should always be kept out on each side of the main body, who detach again from their parties flankers. In the movement of a large column, light cavalry will compose a part of the patrols, and communicate with the main body as well as the advanced and rearguards.

The passage of rivers is effected by means of permanent or temporary bridges, fords, and, in the winter season, sometimes on the ice; but fords and the ice should never be relied on to keep open the communications, as they are liable to be destroyed by a freshet or a thaw. Cavalry and infantry can ford a stream when the depth is not more than four feet, and artillery when the depth is not over two and a half feet. Fords are generally found near the elbows of rivers; and, when they are to be crossed, stakes should be placed in the direction of the ford, to show its width. In selecting a ford, the bottom should be examined. Solid gravel is the best. The nature of the bottom, if of soft mud, or covered with fragments of stones, frequently renders a position otherwise desirable as a crossing impracticable, especially for carriages. In the passage of a ford by a large column, infantry should pass first, then the artillery, and lastly the cavalry. In the passage of a body of troops across a stream on ice, the ice should not be trusted to unless it rests on the water. The heaviest guns can cross when the ice is six inches thick; but plank should be placed under the wheels of the guns. When the ice is but three inches thick, infantry and light guns can cross it with safety; but the men should be sent in small detachments, and plank placed under the guns.

The passage of rivers, when near an enemy and likely to be attacked, is an operation of difficulty. Every means should be made use of to deceive the enemy as to the exact point of crossing; and, if a bridge has to be constructed, night is the most favorable time for throwing it across. Batteries of heavy ordnance should be brought to bear on the opposite shore where the passage is to be effected, the guns being placed free from defilement. A place for crossing should be selected where the river bends towards the troops to pass over; by this the batteries can concentrate their fire. During the construction of the bridge, if one has to be made, light troops should be sent over in boats and occupy places under cover: if none can be readily obtained, a slight intrenchment should be thrown up, and these troops remain on the defensive. As soon as the bridge is completed the advance passes immediately across, and, in case of attack, is reënforced with such arms as may be most needed. The main body then follows, with the infantry in advance. On a retreat, when a river has to be passed, the heavy artillery is sent off first and placed as soon as possible on the opposite shore. Field works should be thrown up by an advanced party, under direction of an engineer or other officer, where the stream is to be crossed, to hold the enemy in check. If bridges are to be constructed, as soon as they are completed the main body of the cavalry and the light artillery cross over; the infantry passing next, protected by a strong rearguard composed of troops of all arms, the proportion of each to be regulated by the nature of the ground, character of the pursuit, &c. The rearguard crosses last, leaving a party, if the bridge is a temporary one, to cut it adrift quickly and then proceed over in boats. If it is a permanent one, it should be attempted to blow up a portion of it, to render it impracticable for its immediate passage by the enemy. In a retreat, a single bridge should never be relied upon for the passage of a large column, and every precaution should be adopted to prevent confusion and too much hurry. Staff officers should be stationed near the bridge, and no one except the workmen allowed to go upon it until the order is given to commence the passage.

The bridges that are constructed for the passage of troops are called military bridges: the principal kinds used are those made of boats, pontoons, rafts, and trestles. The principles upon which a floating bridge can be constructed are better explained by giving a description of the pontoon bridge used in the French service. The pontoons, or supports, are batteaux. They are thirty-one feet long, two feet six inches deep, five feet four inches wide at top, and four feet wide at the bottom. They are shaped like a skiff, the head and stern being a few inches higher than the body: the ribs are of oak, the bottom and sides of pine plank, one inch thick. The other materials used are beams, which are called balks; they are four and a half inch scantling, and twenty-five and a half feet long: the flooring is formed of boards termed chesses. These chesses are fourteen feet long, twelve inches wide, and one and a half inches thick. At the place where the bridge is to be constructed, an easy roadway must, if necessary, be cut to the bridge, and an abutment formed by laying a heavy beam perpendicular to the direction of the bridge. This beam is embedded in the earth, and confined by pickets, and placed on the same level as the top of the bridge. Whilst the roadway is being constructed, the batteaux are brought successively into their positions and anchored: if the current is strong, there is an anchor to each batteau placed up stream, and one for every two batteaux placed down stream; these keep the bridge steady. The cables attached to the anchors have all the same inclination: this inclination is ordinarily one tenth; that is, if the river is ten feet deep, the anchor is dropped one hundred feet from the support. The anchor having been placed, the cable is brought up and made fast to the batteau. If the stream is not very wide, a cable can be stretched across, which will greatly facilitate the construction of the bridge. Each batteau is at once attached to this cable by ropes called head lashings. As the batteaux are brought into position and anchored, the balks are laid, and another party place the chesses, or flooring; so that the construction of all parts of the bridge is going on at the same time. The first batteau is placed so that the balks resting on the abutment will project six inches beyond the outside gunwale: five balks are thus laid at equal distances apart, (two feet ten inches between centre lines of balks.) As the balks are placed, they are fastened to each other and also to the batteaux by a rack lashing, iron crotchets being placed inside of the batteau for that purpose. The balks between the first and second batteaux are laid so that their ends project six inches over the gunwales of each, crossing the batteaux, and are lashed to the first balks as well as to the third set, as stated before. They are placed on the same side with reference to the preceding balks; the next set on the other side; and so alternately. The batteaux are fastened to each other by two spring lines, stretched diagonally from near the head of one to near the stern of the other: these lines are fastened to iron rings placed for that purpose. The batteaux nearest the shores are tied to stout stakes, or stumps of large trees, by two ropes to each batteau, one up stream and the other down. When the third bay is commenced, (the term *bay* designating the distance between the centre line of one batteau to the centre line of the next,) pieces of scantling termed side rails are laid. They are fastened upon the flooring over the outside balks by a rack lashing. When the flooring is completed, it is covered with a thin layer of straw or sand, as a protection from the wear. Experiment has proved that this bridge has the requisite strength. The draught of the batteaux, when the bridge is completed, is nine and a half inches; when crossed by a column of infantry, three abreast, in close order, the draught will be one foot seven inches; and the same with a twenty-four pounder, drawn by eight horses, with their drivers, as has been proven.

In the United States service, the pontoons in use are made of India rubber, and are considered superior to the wooden and copper batteaux formerly used. When no pontoon train accompanies the troops, and it is necessary to construct a bridge, the boats found on the river can be made to answer as supports. Flat-bottomed boats are to be preferred; but, when they are not to be had, keel boats may be taken. If the gunwales are not suitable to serve as points of support to the balks, a framework should be placed in the centre of the boat for this purpose — the framework to consist of a sill piece of six-inch scantling, fastened to the bottom of the boat, and a capsill of the same dimensions, which is supported at the proper height by uprights mortised into the cap and sill pieces. This frame is also strengthened by pieces of four-inch scantling placed against the uprights and ribs of the boat. The balks are laid on the caps, and extend two feet beyond, and are secured to them as well as to each other by a lashing. As boats taken this way are generally of unequal size, two small boats can be lashed together to form one support, and a large boat, loaded with ballast, to bring it to the same level. The strongest boats should be placed at the extremities of the bridge.

In our country, where timber is generally abundant near the banks of rivers, the raft bridge will be found to answer every purpose: they can be used on the widest rivers, and can be constructed quickly. The principles for constructing a batteau bridge apply to a raft bridge. In building this bridge, seasoned timber should be taken, if it can be procured. To prevent its increase in weight after being placed in the water, it would be well to tar the ends of the trunks. The trees for the raft are cut from forty to forty-four feet long, and have a diameter from eleven to thirteen inches. The trunks are placed in the water where they assume their natural position. The but ends are then cut away like a whistle, and they are laid side by side, the large ends together, leaving a space between each piece of about five inches. Each trunk should project a little beyond the one nearest the outside, the middle piece projecting the most: the trunks must be united by four cross pieces, one near each end, and two centre ones ten or twelve feet apart. These pieces are fastened by wooden pins driven through auger holes, or else by a rope lashing. Three sleepers are laid across the centre cross pieces — one over the middle of the raft, and the other two near the outside trunks. The rafts should be as far apart as practicable, to allow a free passage to the water. On navigable streams, a draw made of boats can be placed in the channel way. The balks should extend at least one foot beyond the middle sleepers of the two rafts on which they rest, and be secured to each other and to the sleepers by a lashing. The flooring is laid on the balks as in the batteau bridge, and the rafts are connected by a beam at the head and stern. The rafts are anchored with two anchors — one up stream, and the other down. As a substitute for anchors when they cannot be procured, mill or other large stones can be used; also bags filled with stones. The number of trunks in each raft will vary with the load it has to bear: thirty-four in each makes a strong bridge. The but ends should be placed up stream, and the flooring lower down stream than the centre of gravity of the rafts, as the tendency of the current on the up-stream cables is to submerge the head of the raft. On narrow and gentle streams, rafts can be made of empty casks, barrels, &c., by lashing a number together. A flying bridge consists of one or two boats lashed together, and propelled from one shore to the other by the action of the current against the side of the bridge. The most usual form of construction is two boats, connected together by joists laid across the boats, and a flooring on the joists. This bridge is attached by a cable to one or more anchors or some fixed support in the middle or other part of the stream. The cable should be equal to once and a half the width of the stream at the crossing point, and is attached to the platform by passing over a cross piece, supported above the platform by uprights. This cable is fastened to a windlass at the stern on the platform, so that it can be let out in case of any danger from action of the wind, &c., and the slack again taken up when necessary. These bridges can be directed by an oar astern; and, when used to effect a passage by surprise, the platform can be surrounded by bags of cotton or wool. The best form of boats to be used in constructing a flying bridge are the long, narrow, flat-bottomed ones, sharp at the bows, and with a length from fifty to ninety feet, and a depth of six or seven feet. A bridge may have two platforms, one above the other. Some judgment is necessary in selecting the position for the anchor. If the velocity of the current is the same on both shores, the anchor should be in the middle of the stream; but if it is unequal, then the anchor is placed nearest the shore where the velocity is least. Sometimes a cable may be attached to the flying bridge and fastened to the two banks; the other cable then acts as the radius of the arc which the bridge describes.

Flying bridges are sometimes constructed with rafts: two or three rows of trunks or beams are laid across each other, and the raft is lined with bags of cotton or wool. When the river is crossed under the enemy's fire, these bags form a breastwork for the troops crossing. Trestle bridges are used only on streams that are four or five feet deep, or to connect a batteau or other bridge with the shore when the stream is shallow near the banks. A trestle is made like a carpenter's horse: the ridge beam is of eight-inch scantling, and usually about sixteen feet long; the legs are of four-and-a-half-inch scantling, and have a spread towards the bottom equal to one half the height. Trestles are generally made six feet high, and placed about nine feet asunder. The flooring, &c., is the same as in a boat bridge. There are also other kinds of military bridges, which are made according to the emergencies and ingenuity of the commanding officer: of this kind are rush bridges, for marshy places; cable bridges, to cross deep ravines; and frame bridges, supported by leathern budgets. In selecting a site for a bridge, the following rules should be observed. 1. Bridges should not be thrown over that part of the river where it is most rapid. 2. The extreme breadth and depth of the river should be avoided. 3. Those parts of the river should be chosen in preference to others where the river forms an elbow and where the banks are not very steep. 4. The approach to the bridge ought not to be obstructed by marshy ground, ravines, &c., and the bridge should not be placed near turnings of the river, when rocks or woods can conceal whatever may happen above them. Whenever the river rises, the pontooners or workmen at the bridge should ease off the cables; and, if there is danger that the bridge will be carried away by a sudden rise, it should be cast loose and swung round to one of the banks. In deep water, a boom should be placed above the bridge to stop heavy floating bodies, which might injure it. Cables or logs may be employed, and also a heavy chain, if deemed necessary for the security of the bridge. In shallow streams a stockade can be formed, with an angle up stream, four hundred yards above the bridge. Posts of observation, provided with boats and grapnels, should be established to watch the boom, or stockade, and all floating bodies should be arrested. To take up a bridge, the operations are the reverse of those for laying it: the operation is commenced at the shore to be abandoned. In a retreat, coolness and good order must be observed by the workmen engaged in removing the bridge. Every man should know what it is his particular duty to do, and the places of any that are shot should be immediately supplied; and every thing should be done promptly, but not with too much hurry. A small party protect the pontooners or others engaged in taking away the bridge. The chesses and balks nearest the shore to be abandoned are taken up and quickly removed to the opposite bank, where they are piled together, and form a small breastwork. The ropes which fasten the ends of the bridge are cut, all the cables slipped lying up river, and the stream carries what remains of the bridge to the opposite bank. This swinging of the bridge is greatly facilitated by ropes, or *guys*, attached to the head and stern of the second support from the shore to be abandoned, and a stout rope also attached to the fourth support from the opposite shore, drawn tight, and fastened to a strong stake previously placed up stream fifty yards from the bridge. The bridge is detached from the banks, the anchor cables eased off, and the bridge swayed round by men placed at the guys attached to the second support. As the bridge swings off, the party protecting the workmen take to the boats or rafts prepared for them.

SECTION II.—*March of an Army, composed of several Columns, beyond the Reach of the Enemy.*

Marches beyond the reach of the enemy, of an army composed of several columns, can be classified as ordinary marches, accelerated marches, and marches *en poste*. Troops in these marches must not be crowded or dispersed too much. For the purpose of facilitating the march, a great extent is given to the front of the march sometimes by multiplying the number of *débouchés*. Cavalry, when it marches in large bodies, should avoid narrow *débouchés*, and must also avoid, if possible, broken or mountainous districts. The batteries of artillery follow the divisions of infantry to which they belong; several batteries may, however, be united to follow the same route, when there are but few roads practicable for carriages. When the number of roads permit, the heavy baggage belonging to each corps will follow its own corps; and the provision wagons and those of the hospital form particular columns. The divisions of the army are all put in march at the same time, or else successively — this last arrangement being the most frequent. A table should be made which should contain from day to day the principal place of the cantonments to be occupied by each corps or each division of the army. In the general disposition, care should be taken that two corps or different divisions should not have to pass through the same defile on the same day; but, as sometimes it cannot well be avoided, the chief of the general staff will determine the hour at which each one of these corps should be there.

Accelerated marches are made to anticipate the enemy on an important point, to get possession of a post, to carry succor to a threatened object, and to change the theatre of war unexpectedly. They must be calculated so as to insure the greatest possible celerity; and, if necessary, the whole army, or at least a corps, to the support of which the rest can be brought, must make forced marches. Every soldier should carry bread for two or three days, whether he subsists by issues or lives at the expense of the inhabitants. The mounted troops should take with them a certain amount of grain per horse: they should draw their forage either from depots established along the route, or procure it from the people of the country. The surest way to give all the celérity possible to the movement is, to divide the troops a great deal. All the means the country affords to assist in accelerating the march should be made use of. Sometimes we can profit by the horses of the country to reënforce the draught animals. If there is a navigable river, we can embark a part of the army. Steamboats, railroads, and other means of transportation should be made use of, especially to forward the corps which ought to arrive first at its destination. Large armies should be divided into several corps, for the following reasons: viz., first, these corps march more rapidly, even if each one is obliged to remain united, and they are divided afterwards more easily; secondly, the columns of artillery and baggage are not so great, and do not clog each other; thirdly, following different directions, these corps find in the country more resources for subsistence, for reënforcing the animals, and for obtaining means of transportation. The different corps of an army, divided to execute an accelerated march, reunite afterwards on or at some distance from the point where it is to act, this junction being effected beyond the reach of the enemy.

CHAPTER IV.

MARCHES OF AN ARMY WITHIN REACH OF THE ENEMY.

SECTION I.—*Front Marches.*

THE object of marches within reach of the enemy being to take up a position to attack him, their success will depend on two things — their opening, and the manner of executing them. The army must be divided into several columns, or corps, which, following different roads, shall arrive on the same spot, and be ready, by combined movements, to take an order of battle. Each column must have an open or known road, or at least a direction, on which it can advance, with the aid of the pioneers who precede it. The position of the army, that of the enemy, and the situation of the place towards which the troops ought to move, determine whether the march should be by the front or flank. A march to the front having been determined upon, the army should be divided into three or four columns: these columns ought to be as nearly equal as possible, and of the same composition. The number of *débouchés* will be determined by the number of columns, unless the nature of the country forces us to have fewer than there are divisions. When the country is extremely open, it is sometimes easy to have more than there are divisions. We can take advantage of this feature of the ground to form promptly an order of battle by making several columns of the same division. The artillery follows the columns to which it belongs. In all front marches executed in open countries, the direction of the columns should be combined relative to the necessity of forming every moment an order of battle; for all the points on the march offer places where the enemy can attack the army. In *broken* countries, where it is impossible to form a general disposition, it is not necessary to be so exact. The country that the columns must traverse should be thoroughly reconnoitred, and fields of battle must be examined, where the army can form in case of need: this duty is executed generally by the staff. The front of the march ought to be equal to the space necessary for the deployment of the columns, in all grounds where it may be necessary to form a contiguous order of battle; that is, when the different parts of the army preserve their ensemble, or act together. The ground necessary for the deployment of the whole army is sometimes preserved between the column on the right and that on the left. Sometimes, when the army is composed of five columns, space is left between the columns of the wings for the deployment of three, the columns of the wings leaving sufficient ground on their exterior flanks for their own deployment. Sometimes space is left between the wings for the deployment of four columns only, one of the wings deploying on its exterior flank. The nature of the site determines the extent of the front of the march, in grounds suitable for the formation of separated orders of battle; that is, where the different parts of the army are obliged to act separately. Care must be taken to avoid dispersing the columns over too great an extent of ground; and, on the other hand, they must not be brought too close together. This last, however, would be less injurious than the former, especially when on the march you take the offensive, and an advantage can be obtained by the accumulation of men on one point.

These rules should be observed on the march: viz., the columns must not be separated by a river. All the localities susceptible of protecting the flanks from an attack should be taken advantage of. There must be easy and frequent *débouchés* from one column to another; if not for the passage of troops, there must be some for communicating orders. In broken countries, where the ground separating the columns prevents their deployment, no anxiety need be felt respecting their too great distance from or their too near approach to each other: it will be the same to the enemy. All the localities which add to the strength of the final position, or which may give an advantage over the enemy, must be examined. The important points of these *successive* localities must be seized, and the heads of columns must move on these points, or, if difficult of access, as near as possible to them, so that they may become *points d'appui* of the deployment. Villages which might strengthen the line of battle must be occupied. In passing from covered to open ground, care must be taken not to cause more than two columns to debouch at the same point. Marshy ground should be avoided as much as possible, especially by columns having artillery and cavalry.

The troops should be formed in close column, those of the first line forming the head of the column, the cavalry generally forming the columns on the wings, and the infantry the centre columns, the number of columns being equal to the number of divisions. The batteries march with the divisions to which they belong: the reserve artillery is behind the centre columns. In mountainous countries, however, the cavalry almost always follows the infantry, which forms the head of the column. Sometimes one wing is formed of cavalry, and the cavalry of the other wing is divided among the columns of infantry, owing to the difficult nature of the ground on that side. Sometimes the nature of the ground makes it necessary to put all the cavalry in one wing. In a broken country, where there are bridges, defiles, and small plains, and where each column may have to fight separately, the cavalry must be divided among the several columns, marching sometimes in the rear, sometimes at the head, the kind of troops most suitable to the ground and the object in view being at the head of the column. There is only one case where the centre columns can be composed entirely of cavalry; and that is when the army is to be divided into two corps during the march, and destined to act separately, and it is necessary to protect the flanks of each. In a very open country, where the object is to form rapidly an order of battle, several columns should be made of the same division, in order to shorten the deployments. When it is necessary to begin the attack on a particular point with a heavy fire of artillery, batteries drawn from the reserve can be added to those attached to the columns that are to make the attack.

To support a wing of cavalry, one or more batteries of horse artillery are joined to it: this artillery marches at the head of the column. In an offensive movement, the posts and defiles necessary to keep up a communication between different parts of the army should be occupied as the columns advance. All the corps, as they pass these points, should leave the troops required for their defence, unless particular detachments are detailed for this object, who are to remain until the movement of the army is finished. The columns should keep dressed on each other when the nature of the ground permits the manœuvres of different parts of the army to be connected. If several columns have to arrive at the same time, and cannot communicate during the march, each of these columns must halt on several points of its *débouchés* determined by the order of march, and must depart at an hour likewise indicated in the order of march, these hours being made to depend on the distance. If the army has to cross a river, the chief of the advanced guard that precedes the other troops, having arrived with his force on its banks, will begin by sending some infantry to the opposite side and establishing some pieces of artillery to protect the operation. He will construct or repair a bridge, if necessary, and then send across more infantry, with some artillery, to protect the passage of the rest of the troops forming the advance. The advance, having crossed, will form line, if the enemy threatens an attack; if he does not, the column will be closed in mass and resume the march. The cavalry of a column should not pass before the infantry unless the enemy is in full retreat. When the other columns approach the bank, they should not cross until their chiefs are informed by orders, by the firing or by signals, that the corps on the exterior bank has succeeded in its operation. When it is necessary to form an order of battle, the general will decide according to circumstances on what point to direct the advanced guard — whether to deploy it, and mask the deployments of the other columns, or to employ it in making a false attack, to deceive the enemy as to his real projects. While the advance is executing the movements assigned to it, its artillery, or that of the column where the general may be, will give signal for the army to prepare for deployment. At this the route step is dropped, the columns closed in mass, and the necessary distances taken. The artillery will then march by section.

The enemy having been reconnoitred and the order of battle determined upon, this order is formed by indicating to each chief of column the points upon which he is to direct himself and the position he is to take. At this time, also, detached posts which may contribute to the success must be occupied by either the advance, by light troops, or troops from the second line. Light troops must be employed to clear the march and to guard the *débouchés* between the columns. If the enemy's light cavalry approach near, some volleys of artillery should be fired at them, and light cavalry should be detached against his skirmishers. Light infantry or skirmishers should skirt along the army when moving to order in battle, following the woods and heights; and some squadrons of light cavalry should be in hand to use in case of need. If the enemy's light troops occupy a post to stop or retard the march, they should be attacked by infantry of the line, protected by flankers; and, if they are obliged to cross a plain in retreat, an attempt to cut them off by cavalry should be made.

The advanced guard of an army, in front marches, covers its movements. Its strength and composition depend on the nature of the country and on its destination. In open countries, it is strong in cavalry. It must have just enough artillery to enable it to carry the posts it may meet or to maintain itself in a position that it may take up. When the columns are separated from each other by the nature of the ground, each one should have its particular advanced guard. The advanced guard marches sometimes in front of the centre column; sometimes it is directed successively on the keys of the different positions that the army or the enemy can occupy. When it is desirable to deceive the enemy by making him apprehend a general battle, the advanced guard can be sent to threaten the front, and one of the columns of the wings against a flank. The advanced guard must only be kept at such a distance as to be sustained by the army, unless it is strong enough to act by itself. When the enemy is to be attacked, it must be near one of the columns. The chief of the advanced guard should press vigorously all corps which he may find in front of him until he has gained the point where he is to stop: that post must be occupied in the most suitable manner. Troops should be thrown into the defiles on its front and flank, patrols kept constantly out, and the position obstinately maintained, to give time for the arrival of the main body, or a great part of it. The commanding general must be informed of every thing that happens or is discovered; and the commandant of the advanced guard should examine the nature of the country with the greatest care. Defiles between the advanced guard and the army and those by which the former may be cut off must be occupied by infantry, and in some cases also by artillery. The detachments left to occupy and guard these places join and follow in rear of the columns. When there are several advanced guards, they must each conform to these principles.

SECTION II.—*Flank Marches of an Army within Reach of the Enemy.*

The object of this kind of march is to move the army parallel to its front and to form an order of battle on the flank of the march. Hence, in plains where the troops are formed in two lines, there will be two columns. In hilly or broken country, where the infantry forms the first line or lines, and the cavalry the last, the army is sometimes divided into three, sometimes into four, columns; but in open countries the number may be multiplied when we can unite the cavalry of the wings and form several columns of it on the interior flank, (the interior flank being the one farthest from the enemy.) In this case, the cavalry can be promptly moved to the wings when an order of battle is to be formed, or the whole force of that arm can be easily carried to one particular wing. The number of *débouchés* will be the same as the number of columns. The direction of the first column — that is, the column on the exterior flank — regulates that of the others; this column must therefore be directed according to the previous *reconnaissances* of the country on the exterior flank, along a suite of battle fields or obstacles susceptible of covering the march. Care must be taken not to direct the *débouché* of the first column into ground where the troops can only fight at a disadvantage. Ravines and hollow roads should be avoided; and bridges and defiles on the exterior flank must be either broken up, or occupied, if they are capable of favoring the enemy in an attack on the exterior flank of the march. All marshes and other obstacles must, as much as possible, be left on the exterior flank, rather than on the interior flank, of the columns; but, if they cannot well be left on the exterior flank, they must be left on the interior flank far enough back so as not to interfere with the manœuvres: they must not be kept between the columns. The posts suitable for covering the exterior flank of the march, such as isolated villages, farm houses, enclosures, &c., must be reconnoitred and occupied, if necessary. The access to these posts from the first column must be rendered easy. If there is a village, or marsh, or wood filled with underbrush susceptible of securing either flank of a position perpendicular to the line of march, when the *débouchés* pass through open ground, where the enemy can attack the heads of columns, these posts should be left on the interior flank. The distance between the columns should be increased for the purpose of forming line of battle, perpendicular to the direction of the march, in open ground where the enemy can attack the heads of columns. No fixed rules can be laid down for the different orders of flank marches. Genius must arrange their forms according to varying circumstances. It may, however, be stated, that cavalry forms the interior columns only in mountainous countries or when the course of a river is followed. It forms the head and rear of the columns only in very open countries, where the enemy can attack either wing, and it is kept mostly in the rear when the heads of columns are directed on grounds where it would be of little service. On a march under fire, where the cavalry is to be in the wings in the order of battle, it is necessary to form particular columns of it on the interior flank, opposite the head and rear of the infantry, in such a manner that each wing of cavalry will only have to face to the front and move forward to enter the line. The batteries of each division march at the head or rear of the troops of each column: the reserve batteries form a column which must have its particular *débouché*. When the batteries cannot follow their columns, they must rejoin them as soon as possible. Most of the rules for front marches are also applicable to flank marches; but there are others peculiar to the latter. All the troops march at route step in column by platoon at full distance, except when the front of the march is threatened. When that danger is passed, the troops which had been closed in mass take full distance. When it becomes necessary to form in order of battle, a signal is given by the artillery; at this, the troops take distance in order to wheel into line. The columns dress on each other as much as possible, their heads slackening their pace. The second line approaches to about three hundred paces from the first. The general should take care to occupy by his light troops, by his advanced guard, or, if necessary, by troops drawn from the columns, all posts which may contribute to his success. Whatever is the order of battle, two points should be indicated to each chief of division for its alignment. When the ground is not suitable for an order of battle, defensive or offensive, a corps of troops should be detached to attack the enemy and stop or retard his march, in order to give time to move the columns towards the point on which the battle can be fought at no disadvantage. The passage of rivers is conducted in the same manner in flank marches as it is in front marches; and, when the columns are separated by impenetrable localities, they are governed by the same principles as those governing front marches in like cases.

The advanced guard, in its force and composition, is the same as in front marches, and is conducted according to the same principles.

When the columns are obliged to march at some distance from each other, each one must have its particular advanced guard. The advanced guard must march by its proper flank, two or three thousand paces on the exterior flank of the columns, when the enemy moves on a line parallel to them, but cannot anticipate them on the point towards which they are directed. The advanced guard sometimes masks the movement of the army, in suitable grounds, by moving forward as if to attack; but it should not become too much engaged. The advanced guard marches before the heads of columns when it is necessary to seize rapidly an important point or post, or when a river or defile is to be passed and it is important to occupy their *débouchés* promptly; also when a post is to be attacked near which the heads of columns have to pass, and when the enemy appear before the heads of the columns, and we want a large corps of troops to cover the manœuvres to be executed. In these cases, if the advanced guard is formed of as many lines as the army, it will form the same number of columns and march like it. When it is necessary for the columns to have each its particular advanced guard, each advanced guard will precede its column. When the advanced guard marches on the exterior flank, its movement must be governed by the same rules as the other columns. When it precedes the army, it must halt or detach troops to occupy any post on the exterior flank which might serve to cover or annoy the march. These troops should rejoin the advance when replaced by others from the columns. The advanced guard of the columns, when each column has its advance, are governed by the same rules.

There must be a rearguard, especially when circumstances are such that the enemy is able to conceal a movement to attack the head or the rear, and also when it is necessary to occupy certain posts to secure the rear. The reserve usually forms the rearguard; but it is essential that its force and composition should be based on its destination and object. When the columns are obliged to march at some distance from each other, each one must have its own rearguard. When the rearguard has to stop behind, troops from the main body must be left on all the intermediate points, and as much as possible in good posts, to preserve it from a check. The rearguard should always remain in order of battle until the whole army has moved: in open countries it follows the movement of the army, keeping as near to it as possible, its columns marching according to the same rules as those of the army. In the passage of a river, the rearguard passes last; and, if so ordered, it breaks up the bridges, carrying off or destroying the materials. If the enemy threatens or attacks the rear of the columns, this guard must act like the advanced guard in the opposite case. Its artillery must be brought freely into action, and its loss be risked, rather than compromise the safety of the army. If the enemy is repulsed, there should, however, be no pursuit. Light troops should be employed in this march in the same manner as in front marches: they must explore and occupy in succession all defiles, hedges, &c., on the exterior flank. There could be with them often, to great advantage, a few howitzers, when they are much exposed to the enemy. When a flank or retrograde march at night is to be concealed from the enemy, light troops are left to keep up the fires of the grand guards of the old camp, to challenge like sentinels, &c.: they should rejoin the rearguard after the dawn of day. In the daytime, to conceal a flank march, the advanced posts should retire in succession, and the light troops thrown out attack with spirit the enemy's advanced posts.

SECTION III. — *Retrograde Marches.*

The combination of several retrograde marches constitutes a retreat, as a series of front marches forms an offensive movement. In a retrograde march, the *débouchés* are opened the same as in marches to the front. The habitual force of the columns is the same; but the disposition of the troops is exactly inverse, the first line being at the rear instead of the head. The number of *débouchés* should be equal to the number of divisions of infantry, the cavalry being divided among them, except in certain cases. Some of these are: 1. When the nature of the ground permits the formation of several columns of each division, we can profit by this means of accelerating the march. 2. When several divisions have to be united into a single column, on account of the nature of the ground not admitting the requisite members of *débouchés.* 3. When the nature of the ground makes it advisable to form the whole of one wing, or of the two wings, of infantry to cover the flank. 4. Sometimes it is advantageous to form nearly the whole of a wing, or of both wings, of cavalry, in order to secure the flanks. The cavalry is mostly in rear on plains, and at the head of columns in broken countries. The different arms should never be mixed together in the columns.

As it may be necessary to commence the movement at night, in order to get a certain start, or to take advantage of the darkness to mask the dispositions for retreat, so that the enemy may not be able to combine an offensive operation, the greatest order must prevail, so as to prevent confusion and noise. The inconvenience of night marches frequently induces an army to make, if possible, a short march to a position near defiles in its rear, there to wait for daylight. The troops ought to be ployed into close column; but, when the wings are liable to an attack, they should be formed at full distance. Most of the artillery goes in advance of the columns; but a sufficient number of light pieces should remain in rear. Sometimes more artillery is attached to a column than its proportion, when this column is directed on points the occupation of which will stop pursuit. In all cases, the troops most advanced, that is, nearest the enemy, move first, unless they occupy the key of the position the army is about to quit, or are to form a part of a column that is to remain behind. At the beginning of the movement, the artillery placed at different points is withdrawn. If the artillery arm redoubts, passages should be opened through the parapets and the pieces taken out by hand with the greatest silence; it then rejoins the columns to which it belongs. If the march is to raise a siege, the troops guarding the trenches are relieved, the artillery firing as usual. The pieces are withdrawn gradually as the troops leave the trenches, commencing with those nearest the place. This operation is always executed at night. The artillery is conducted to some rendezvous at a distance from the trenches, and then marches with the army. Detachments composed of infantry and artillery should be sent in advance, to occupy defiles or posts in the rear which the enemy might get possession of before the arrival of the heads of columns. There must be also sent a detachment to occupy any post or defile which may secure a flank of the army during the march. Sometimes it is necessary to detach a corps to cover a flank. The force and composition of this body will vary according to circumstances. When near the army, it is regarded as one of its columns. Large detachments should, however, be avoided in retrograde marches. When a river has to be passed in the presence of an enemy who has a great many detached corps, detachments should be sent to attack the passages above and below the place where the crossing is intended. The detachments sent out to guard a defile, or to occupy a post, &c., must maintain the position until the last troops have arrived, and then, withdrawing, join the rearguard. The rules prescribed for front marches are nearly all applicable to retrograde marches.

The Rearguard.—The object of the rearguard is to oppose the enemy, so that his approach may not retard the march of the other troops, and to protect the formation of an order of battle when that becomes necessary. If the ground between the columns is absolutely impracticable, each one must have its particular rearguard; or it will be divided into parts, one of which stops while the other marches. This method is very useful in small corps.

The strength and composition of the rearguard depend on the strength of the army, the force and distance of the enemy, and also on the nature of the ground. In plains, a great part ought to be cavalry. If the army cannot remain within supporting distance, it ought to be strong enough to resist the enemy by itself. When it possesses the key of a position, it must stop the enemy for a certain time as if the whole army was present. The artillery attached to the rearguard must be kept boldly in use. In retreats, little importance should be attached to the loss of artillery, when by risking it, in keeping it a few moments longer in battery, we may prevent a defeat, secure the safety of the army, and save the lives of soldiers who cannot be easily replaced. There should be some engineer soldiers or workmen with the rearguard to ruin the passages the enemy might use to pursue the army. If the defiles through which the columns of the army will have to pass have not been occupied in advance, the first infantry and artillery that arrive should be employed for that purpose. These troops will place themselves on the flanks of the defile, covering the front from which the columns are to come, and leaving them a free passage. The rearguard, or guards, as the case my be, place themselves in order of battle checkerwise between the defiles and the enemy. When the whole army or column which the rearguard is to cover has entered, the first line passes through the intervals of the second into the defiles. The first having passed, the second line withdraws in the same manner, under cover of the fire of the troops established on the flanks of the defile, when they also follow in the rear, to form the rearguard. At the commencement of a retrograde march, the rearguard remains as long as possible in the key of the position, — even to the break of day, if necessary, — and then the picket or grand guards join it. There are only two cases when the army ought to be divided into several distinct corps to effect its retreat: 1. When the nature of the ground compels it, and deprives the army of all the advantages offered by tactics. 2. When we have resolved not to offer battle on any terms.

APPENDIX.

I.—DRESS PARADE.

II.—GUARD MOUNTING, TAKEN FROM UNITED STATES ARMY REGULATIONS.

III.—TABLE OF UNITED STATES ORDNANCE.

IV.—TABLE OF RANGES, TAKEN FROM UNITED STATES ORDNANCE MANUAL.

FORMS OF PARADE.

I.—DRESS PARADE.

THERE is daily at least one dress parade, which may be at *troop* or *retreat*, as the commanding officer may direct. The parade at *troop* is called the morning parade, and that at retreat the evening parade. It is conducted as follows: A signal will be beat or sounded half an hour before *troop* or *retreat* for the music to assemble on the regimental parade. At the same time, each company will turn out under arms on its own parade for roll call and inspection by its own officers. Ten minutes after that signal the adjutant's call will be given, when the companies will be marched (the band playing) to the regimental parade, where they will be formed in their relative positions in the order of battle, arms ordered, and at a rest — the officers at their post on foot with swords drawn, the adjutant on the right of the line. The music will be formed in two ranks on the right of the adjutant, and from the adjutant's call to *troop* or *retreat* the band will play. The senior officer present takes the command of the parade, and will take post at a suitable distance in front, opposite the centre, facing the line. Ten minutes after the *adjutant's call*, the adjutant will order the music to *beat off*, when it will commence on the right, beat in front of the line to the left, and back to its place on the right. When the music has ceased, the adjutant will step two paces to the front, face the line, and command, 1. "Attention!" 2. "Battalion!" 3. "Shoulder — arms!" 4. "Prepare to open ranks!" 5. "To the rear — open order!" 6. "March!" 7. "Right — dress!"

At the sixth command the ranks will be opened according to the tactics, the commissioned officers marching to the front, company officers four paces, field officers six paces, opposite to their positions in order of battle, where they will halt and dress. The adjutant, seeing the ranks aligned, will command, "Front!" and march along the front to the centre, face to the right, and pass the line of company officers eight or ten paces, where he will come to the right about, and give the word, "Present — arms!" when arms will be presented, officers saluting. Seeing this executed, he will face about to the commanding officer, salute, and report, "Sir, the parade is formed." The adjutant will then, on intimation to that effect, take his station three paces on the left of the commanding officer, one pace retired, passing round his rear. The commanding officer, having acknowledged the salute of the line by touching his hat, will, after the adjutant has taken his post, draw his sword, and command, 1. "Battalion!" 2. "Shoulder — arms!" and add such exercises as he may think proper, concluding with, "Order — arms!"

The adjutant will now pass round the right of the commanding officer, advance upon the line, halt midway between him and the line of company officers, and command, 1. "First sergeants — to the front and centre!" 2. "March!" At the first word they will shoulder arms as sergeants, march two paces to the front, and face inwards. At the second word they will march to the centre and halt. The adjutant will then order, 1. "Front — face!" 2. "Report!" At the last word, each in succession, beginning on the right, will salute by bringing the left hand smartly across the breast to the right shoulder, and report the result of the roll call previously made on the company parade; as, "All present, or accounted for;" "One private absent," &c. The adjutant again commands, 1. "First sergeants, outward — face!" 2. "To your posts — march!" when they will resume their places and order arms. The adjutant will now face to the commanding officer, salute, and give the result of the first sergeant's reports. The commanding officer will then direct the orders to be read, when the adjutant will face about and announce, "Attention to orders!" He will then read the orders.

The orders having been read, the adjutant will face to the commanding officer, salute, and report; when, on intimation from the commander, he will face again to the line, and announce, "*The parade is dismissed.*" All the officers will now return their swords, face inwards, and close on the adjutant — he having taken position on their line, the field officers on the flanks. The adjutant gives the word, 1. "Front — face!" 2. "Forward — march!" when they will march forward, dressing on the centre, the music playing; and, when within six paces of the commander, the adjutant will give the word, "Halt!" The officers will then salute the commanding officer by raising the hand to the cap, and there remain until he shall have communicated to them such instructions as he may have to give or intimates that the ceremony is finished. As the officers disperse, the first sergeants will close the ranks of their respective companies and march them to the company parades, where they will be dismissed, the band continuing to play until the companies clear the regimental parade.

II. — GUARD MOUNTING.

THIRTY minutes before guard mounting, a call is sounded for the men warned for duty to turn out on their company parades for inspection by the first sergeants, superintended by a commissioned officer of each company. Ten minutes after, a second call is sounded for the duty men to repair to the regimental parade, conducted by the first sergeants. Each detachment, as it arrives, will, under the direction of the adjutant, take post on the left of the one that preceded it, in open order, arms shouldered and bayonets fixed, the supernumeraries five paces in the rear of the men of their respective companies. If the guards are intended for the grand parade, they will take post in the order prescribed above, under the direction of the general staff officer, or his assistant, the adjutant of the day.

The following regulations respecting mounting guards were drawn up with reference to the grand parade: with a few obvious variations, they will equally apply to regimental parade.

The ranks being opened and aligned, the officers of guards will, at the word "Front!" take post twelve paces in front of the centre, in one line, according to rank, and with swords drawn — the sergeants in one rank, four paces in rear of the officers; and the corporals in one rank, four paces in rear of the sergeants; the whole facing to the front. The adjutant of the day will dress the lines, count the files, verify the details by reference to written orders, and tell off the guards; whilst the general staff officer appoints the officers and non-commissioned officers to the several guards and designates the posts which they are to occupy.

The staff officer will then command, 1. "Officers and non-commissioned officers!" 2. "About — face!" 9. "Inspect your guards — march!" The commander of each guard then commands, 1. "Order — arms!" 2. "Inspection of arms!" The two highest in rank of each guard will divide the ranks between them, accompanied by the other officers, and inspect accordingly. During the inspection, the band plays. The inspection ended, the officers and non-commissioned officers will take post in their respective guards, as though each guard was a company of a battalion, in open order, under review; at which time, also, the officers of the day will take post in front of the centre of the guards — the old officer of the day on the right of the new officer of the day, one pace retired.

The staff officer then commands, 1. "Parade — rest!" 2. "Troop — beat off!" when the music, beginning on the right, will beat down the line in front of the officers of the guards to the left, and back to its place on the right, where it will cease to play. The staff officer then continues, 1. "Attention!" 2. "Shoulder — arms!" 3. "Close order — march!" At the words, "Close order!" the officers will face about; at "March!" resume their posts in line. The officers having taken their posts in line, the staff officer will command, "Present — arms!" at which he will face to the new officer of the day, salute, and report, "Sir, the guards are formed." The new officer of the day, after acknowledging the salute, will give the necessary instructions to the staff officer, who will cause the same to be executed, the staff officer giving the word of command; but if the staff officer should be senior to the officer of the day, he would report without saluting with the sword, and immediately retire. In this case, the adjutant of the day would be instructed to give the following orders, or the officer of the day would give them himself. The guard having shouldered arms and performed such exercises as may be required by the officer of the day, the staff officer will again command, 1. "By-guard — (a platoon) — right — wheel!" 2. "March!" 3. "Pass in review!" 4. "Column — forward!" 5. "Guide — right!" 6. "March!" when the whole will march past the officer of the day, according to the order of review, conducted by the staff officer, marching on the left of the first division — the adjutant of the day on the left of the last division.

When the column has passed the officer of the day, the guards will break off under their respective commanders and take the route to the several posts assigned them, the staff officers breaking off at the same time. The music for the parade, which has wheeled out of the column and taken post opposite the officer of the day, will cease, and the old officer of the day salute and give the old or standing orders to the new officer of the day. The supernumeraries, at the same time, will be marched by the first sergeants to their respective company parades and dismissed. Guards which are assigned to new posts will be conducted to and established in them by the officer of the day and the staff officer despatched from head quarters for the purpose. In bad weather, the ceremony of turning off guards on the usual parades may be dispensed with by the officer of the day, and the inspection be made under shelter. Also, in case of guards which may have to mount in the night or at the close of the day, after fatiguing marches, the ceremony of turning off may be dispensed with, but never that of inspection. The officer of the day will be always present at guard mounting. No other officer except a general officer will interfere with or give any order on the parade to the staff officer on duty there. The commander of the troops, though under the rank of general, is of course an exception to this rule. The regiment that furnishes the adjutant of the day will also furnish the music for the grand parade. The guards are to move in the greatest order to their respective posts, marching by platoons, when the road will permit. The officer of the old guard having his guard paraded, on the approach of the new guard, commands, "Present — arms!" The new guard will march in quick time past the old guard, at shouldered arms, officers saluting, and take post, three or four paces on its right, where, being aligned, its commander will order, "Present — arms!" The two officers will then approach each other, and the relieving officer take his orders from the relieved. Both officers will then return to their respective guards, and command, 1. "Shoulder — arms!" 2. "Order — arms!"

The officer of the new guard will now direct his sergeant to make a list of the guard, dividing them into three reliefs, and will himself proceed to take possession of the guard house, or guard tent, and the articles and prisoners in charge of the guard. During the time of relieving sentinels and of calling in the small posts, the commanders of the two guards will, when near the enemy, visit the avenues leading to the post, the old commander giving to the new all the information he may possess relative to the enemy. The detachments from the old guard having come in, it will be marched at shouldered arms along the front of the new guard in quick time, the new guard standing at presented arms, officers saluting, and the music of both guards beating, except at the outposts, where it is prohibited. On arriving at the camp, or post, the commander of the old guard will send the detachments composing it, under the charge of an officer or non-commissioned officer, to their respective regiments. Before the men are dismissed, their pieces are drawn or discharged at a target. On rejoining their companies, the chiefs of squads will examine the arms of their men and cause them to be put away in good order.

III.—TABLE OF U. S. ORDNANCE.

[From United States Ordnance Manual.]

The following are the kinds and calibres of ordnance used in the land service of the United States:—

KINDS OF ORDNANCE.		CALIBRE.	MATERIAL.
Guns,	Field,	6 pounder,	Bronze.
		12 pounder,	
	Siege and Garrison,	12 pounder,	Iron.
		18 pounder,	
		24 pounder,	
	Sea coast,	32 pounder,	
		42 pounder,	
Howitzers,	Mountain,	12 pounder,	Bronze.
	Field,	12 pounder,	
		24 pounder,	
		32 pounder,	
	Siege and Garrison,	8 inch,	Iron.
		24 pounder,	
	Sea coast,	8 inch,	
		10 inch,	
Columbiads,		8 inch,	
		10 inch,	
Mortars,	Light,	8 inch,	
		10 inch,	
	Heavy,	10 inch,	
		13 inch,	
	Stone Mortar,	16 inch,	Bronze.
	Coehorn,	24 pounder,	
	Eprouvette,	24 pounder,	Iron.

IV.—TABLE OF RANGES.

Ranges of Field Guns and Howitzers.

The range of a shot or shell is the first graze of the ball on horizontal ground, the piece being mounted on its appropriate carriage. The range of spherical case shot is the distance at which the shot bursts near the ground, thus showing the elevation and length of fuse required for certain distances.

KINDS OF ORDNANCE.	POWDER	BALL.	ELEVA'N	RANGE.	REMARKS.
	Lbs.		° ′	Yards.	
6 pounder Field Gun,	1.25	Shot.	0	318	
	"	"	1	674	
	"	"	2	867	
	"	"	3	1138	
	"	"	4	1256	
	"	"	5	1523	
	1.	Sph.case	2	650	Time of flight 2 seconds.
	"	shot.	2.30	840	" 3 "
	"	"	3	1050	" 4 "
12 pdr. Field Gun, . . .	2.5	Shot.	0	347	
	"	"	1	662	
	"	"	2	909	
	"	"	3	1269	
	"	"	4	1455	
	"	"	5	1663	
	1.5	Sph.case	1	670	Time 2 seconds.
	"	shot.	1.45	950	" 3 "
	"	"	2.30	1250	" 4 "
12 pdr. Field Howitzer,	1.	Shell.	0	195	
	"	"	1	539	
	"	"	2	640	
	"	"	4	975	
	"	"	5	1072	
	0.75	Sph.case	2.15	485	Time 2 seconds.
	"	shot.	3.15	715	" 3 "
	"	"	3.45	1050	" 4 "
24 pdr. Field Howitzer,	2.	Shell.	0	295	
	"	"	1	516	
	"	"	2	793	
	"	"	3	976	
	"	"	4	1272	
	"	"	5	1322	
	1.75	Sph.case	2	600	Time 2 seconds.
	1	shot.	3	800	" 3 "
	2	"	5.30	1050	" 4 "
32 pdr. Field Howitzer,	2.5	Shell.	0	290	
	"	"	1	531	
	"	"	2	779	
	"	"	3	1029	
	"	"	4	1203	
	"	"	5	1504	
	"	Sp. c. sh.	3	800	Time 2.75 seconds.

Ranges of Heavy Ordnance.

The range of a gun or howitzer in this table is the first graze of the ball on the horizontal plane on which the carriage stands.

KIND OF ORDNANCE.	POWDER	BALL.	ELEVA.	RANGE.	REMARKS.
18 pdr. Siege and Garrison Gun, on barbette carriage,	4.5 lbs.	Shot.	1°	641 yds.	
	"	"	2	950	
	"	"	3	1256	
	"	"	4	1450	
	"	"	5	1592	
24 pdr. Siege and Garrison Gun, on siege carriage,	6	"	0	412	
	"	"	1	842	
	"	"	2	1147	
	"	"	3	1417	
	"	"	4	1666	
	"	"	5	1901	
	8	"	1	883	
	"	"	2	1170	
	"	"	5	1834	
32 pdr. Sea-coast Gun, on barbette carriage,	8	"	1	713	
	"	"	2	1110	
	"	"	3	1433	
	"	"	4	1684	
	"	"	5	1922	
	1067	"	1	780	
	"	"	3	1517	
42 pdr. Sea-coast Gun, on barbette carriage,			0		
	10·5	"	1	775	
	"	"	2	1010	
	"	"	5	1955	
	14	"	1	770	
	"	"	2	1128	
	"	"	5	1915	
8 inch Siege Howitzer, on siege carriage,	4	Shell. 45 lbs.	0	251	
	"	"	1	435	
	"	"	2	618	
	"	"	5	1241	
8 inch Sea-coast Howitzer, on barb. carriage,	4	45 lbs.	1	405	
	"	"	2	652	
	"	"	3	875	
	"	"	5	1300	
	8	"	1	646	
	"	"	3	1190	
	"	"	5	1800	
10 inch Sea-coast Howitzer, on barb. carriage,	12	90 lbs.	1	580	
	"	"	2	891	Time 3 seconds.
	"	"	3	1185	
	"	"	5	1650	Time 6 seconds.
8 inch Columbiad, on barbette carriage,	10	Shot. 65 lbs.	1	932	Axis of gun 16 ft. above the water.
	"	"	2	1116	
	"	"	5	1847	
	"	"	8	2397	Shot ceased to ricochet on the water.
	"	"	27	4481	

KIND OF ORDNANCE.	POWDER	BALL.	ELEVA.	RANGE.	REMARKS.
8 inch Columbiad, on barbette carriage, *continued,*		Shell.	°	Yards.	
	10 lbs.	50 lbs.	1	919	
	"	"	2	1209	
	"	"	5	1813	
	"	"	10	2657	
	"	"	15	3556	
	"	"	27	4171	
	15	"	27.30	4468	
10 inch Columbiad, on barbette carriage,		Shot.			
	18	128	0	344	Axis of gun 16 ft. above the water.
	"	"	1	752	
	"	"	3	1230	
	"	"	6	2037	Shot ceased to ricochet on water.
	"	"	10	2777	
	"	"	20	4020	
	"	"	35	5443	
		Shell.			
	12	100	1	800	
	"	"	2	1012	
	"	"	5	1604	
	18	"	0	448	
	"	"	1	747	
	"	"	3	1239	
	"	"	5	1865	
	"	"	10	2848	
	"	"	20	3885	
	"	"	35	4828	Time 35 seconds.
12 inch Columbiad, . .	20	172 lbs.	10	2770	Time of flight, 11 sec.
	"	"	15	3731	" " " 16 "
	"	"	30	5004	
	"	"	35	5339	Time of flight, 32 sec.
	25	"	10	2881	" " " 11 "
	"	"	35	5409	" " " 32 "
	28	180 lbs.	39	5761	3⅓ miles. Time 36 sec.
10 in. Sea-coast Mortar,	10	98 lbs.	45	4250	Time, 36 seconds.
12 in. Sea-coast Mortar,	20	200 lbs.	45	4625	
13 in. Sea-coast Mortar,	20	200 lbs.	45	4325	
10 inch Siege Mortar,	1	90 lbs.	45	300	Time of flight, 6.5 sec.
	1.5	"	"	700	" " " 12 "
	2	"	"	1000	" " " 14 "
	3	"	"	1600	" " " 18 "
	4	"	"	2100	" " " 21 "
	lbs. oz.				
8 inch Siege Mortar,	0 10¾	46 lbs.	45	500	Time of flight, 10 sec.
	1 0	"	"	750	" " " 12¼ "
	1 6	"	"	1200	" " " 14½ "
24 pdr. Coehorn Mortar,	0 5	17 lbs.	45	25	
	1 0	"	"	68	
	4 0	"	"	422	
	8 0	"	"	1200	

FIRING HOT SHOT.

FURNACES for heating shot are erected at the forts on the sea coast. These furnaces hold sixty or more shot. The shot being placed, and the furnace cold, it requires one hour and fifteen minutes to heat them to a read heat. After the furnace is once heated, a 24-pound shot is brought to a red heat in twenty-five minutes; the 32 and 42 require a few minutes longer. Two or three men are required to attend a furnace.

Cartridges for hot shot should be examined before use, to see that there are no holes in them. It is best to use two cartridge bags, one within the other.

Manner of Loading. — Elevate the muzzle sufficiently to allow the ball to roll in; ram the cartridge home carefully, and a dry wad over it; then a wet wad of hay or clay; *prick and prime.* Insert the ball, and put a wet wad over it; this wad need be only half calibre long. It is a good precaution also to pass a wet sponge into the gun just before putting in the shot. When wet hay wads are used, steam is seen to issue from the vent as soon as the ball gets home; this is the effect of the heat of the ball upon the water in the wad: no danger can result from it, as the ball can be allowed to cool in the gun without the charge taking fire; but it is better to fire without much delay, as the steam would injure the powder. The penetration of cold and hot shot into wood is equal under the same circumstances. A red-hot shot retains sufficient heat to set fire to wood after having struck the water several times. Fire is communicated more rapidly and certainly to the wood when the ball does not penetrate more than ten or twelve inches; it is proper, therefore, to fire with small charges, one fourth to one sixth weight of the shot, according to distance, in order that the shot may not penetrate too deep.

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